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ON THE DENTITION OF RHYNCHODUS AND OTHER FOSSIL FISHES.

C. R. EASTMAN.

AMONGST Palæozoic chimæroids the complete dentition is known in at least two species of *Ptyctodus*, two of *Rhynchodus* and one of *Palæomylus*. These genera are all included in the family *Ptyctodontidæ* of the Devonian, and present for comparison with recent chimæroids a single dental plate on each side in the upper jaw, with a corresponding pair biting against the outer side of these (as shown by marks of contact) in the lower jaw. The question therefore arises whether the unique dental plate on each side in the upper jaw of *ptyctodonts* is homologous with the so-called "premaxillary" of *Chimæra*, *Callorhynchus*, *Rhinochimæra*, etc., or with the so-called "palatine plate" of the latter, or with both premaxillary and palatine taken together.

This question appears to be answered conclusively in the case of *Ptyctodus*, from which the modern type of dentition is derived by pushing the low and elongate upper dental plate further back in the mouth, and introducing a "premaxillary" or "vomerine" tooth in front of it. In all cases the lower dental plate is vertically deeper than the upper, and rises into a prominent beak anteriorly. It is also characterized by having a descending process at the symphysis, which is more accentuated in the fossil than in recent forms. This process bears a triangular groove or excavation on its inner face, the roughened surface of which indicates that it was occupied by cartilage, since there was no sutural union at the symphysis. That this was the case is self-evident, for the anterior beaks could not have closed outside the upper dental plates when the mouth was shut unless the lower ones were mutually separated by a slight interval.

In a recent communication by Jækel,¹ it is stated that "von

Jækel, O., Ueber *Ramphodus* etc., *Sitzungsber. Ges. naturf. Freunde*, Berlin, 1903, pp. 383-393.

der Zahnform und dem Gesamtgebiss von *Ptyctodus* wissen wir noch nichts genaueres," and it is thought that "vielleicht ist *Ptyctodus* schon ein echter Vertreter der sechszahnigen Holocephalen, . . . die wohl von den *Coccosteiden* abstammen mögen." This author's evident unfamiliarity with the *Ptyctodus* type of dentition is no doubt responsible for his confusion of the upper and lower dental plates of a species of *Rhynchodus* from the Upper Devonian of Wildungen, Waldeck, and for the impossible suggestion that the nasal capsules projected into the triangular incisions which occur in the descending process of the mandibular dental plates.

That which is commonly interpreted as the *lower* dental plate

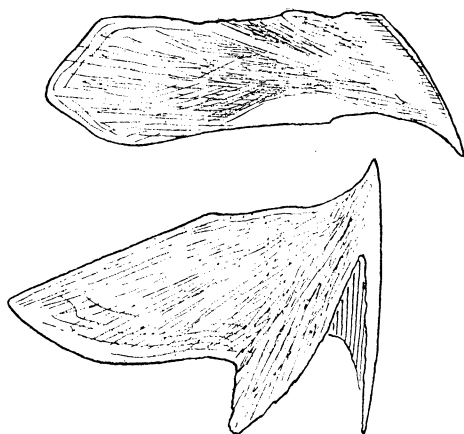


FIG. 1.—Left upper and lower dental plates (inner aspect) of *Rhynchodus major*, from the Upper Devonian of Wildungen (after Jäkel). $\times \frac{1}{3}$.

of *Rhynchodus*, Jäkel homologizes with the "premaxillary tooth" of *Chimaera*; and that attributed to the *upper* jaw of the former, Jäkel supposes to have functioned as a mandibular element. Referring to the lower dental plate from the Eifel Devonian described by F. v. Huene under the name of *Rhynchodus emigratus*, Jäkel states that he prefers to

regard it as a "Præmaxillarzahn," and notes its close resemblance to the Wildungen teeth called by him *Ramphodus tetradon*. So far as one may judge without having compared the original specimens, no essential differences exist between these forms and the earlier described *Rhynchodus major* and *R. rostratus*¹ respectively. An illustration of the Wildungen dental plates is given in the accompanying text-figure 1, slightly modified after Jäkel, that is to say, the latter's figure is inverted, and the upper dental plate is thrust forward so as to protrude beyond the lower.

¹ Eastman, C. R., Dentition of Devonian *Ptyctodontidae*. *Amer. Nat.* vol. XXXII, p. 487, 1898.—*Centralblatt für Mineral.*, 1900, p. 177.

RHYNCHODUS PERTENUIS, sp. nov.

Dental plate narrow and elongate, with sharp and extended cutting edge and knife-blade cross-section; anterior beak prominent, no symphyseal process, external surface smooth.

The unique dental plate upon which this species is founded was obtained from the Chemung of Franklin, in Delaware County, New York, and is preserved in the State Museum at Albany, where the attention of the writer was called to it by Dr. J. M. Clarke, State Palæontologist, but not in time to include its description with other fish remains already made known from the same locality.¹ The general outline and proportions of this form differ from those of all other species, and the absence of a symphyseal process is a very unusual feature. But for the trenchant cutting edge and narrow cross-section, the

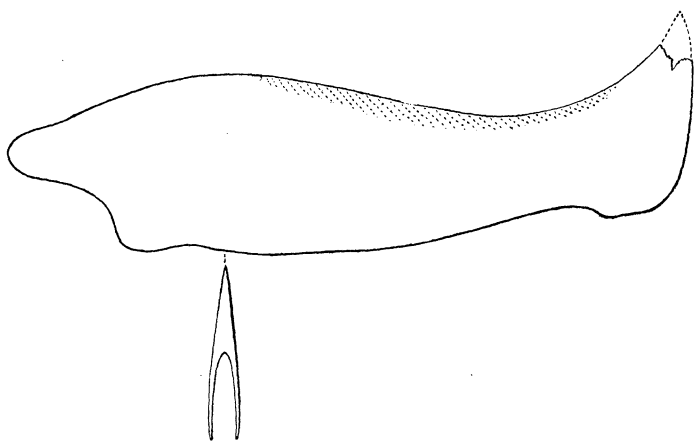


FIG. 2.—*Rhynchodus pertenuis*, sp. nov. Mandibular dental plate, $\times \frac{1}{2}$. Chemung group; Delaware County, New York.

specimen might be readily mistaken for a lower dental plate of *Ptyctodus*, instead of *Rhynchodus*. That it is properly a mandibular element, and referable to the latter genus, seems to admit of no question. The hollow along the base indicates the extent to which the plate was buried in the supporting cartilage of the jaws. The total length is 9 cm.

¹ *Ann. Rept. State Geol. N. Y.* 1897 (1899), pp. 317-327.

Fragments of chimæroid jaws have been previously reported from the Chemung of New York State by Clarke, but no specific identifications were attempted by him. At best this class of remains appears to be very rare in the eastern province, *Ptyctodus* and *Rhynchodus* being the only genera that are known from the New York Devonian. An undescribed species of the former occurs in the Corniferous limestone of Le Roy, and *P. calceolus* is apparently represented in the Hamilton stage at Eighteen Mile Creek, near Buffalo. Detached tritons from both of these localities are preserved in the Museum of Comparative Zoölogy at Cambridge.

ONCHOSAURUS Gervais.

Syn. *Ischyrrhiza* Leidy; *Gigantichthys* Dames.

A comparison of the type specimens of Gervais' *Onchosaurus radicalis*¹ and Leidy's *Ischyrrhiza antiqua*,² the former being preserved in the collection of the School of Mines at Paris, and the latter in the American Museum of Natural History in New York, leaves no room for doubt that they are generically, and probably also specifically identical, in which case Leidy's title must be abandoned. The original of Gervais' description, together with one or two duplicates, was derived from the Upper Cretaceous of Meudon, near Paris, and regarded through error as of mosasaur nature. The identical form occurs also in the Mæstricht Chalk, a remarkably fine specimen from this locality being preserved in the Paris Muséum of Natural History.

The type of Leidy's genus, *I. mira*,³ was founded on a unique tooth from the Cretaceous Greensand of Burlington County, New Jersey, and supposed by the author to represent a Teleost fish related to *Sphyræna*. The original has never been figured,

¹ *Zoologie et Paléontologie Françaises*, vol. 1, p. 262, pl. lix. fig. 26, 1852.

² *Proc. Acad. Nat. Sci. Philad.* vol. VII, p. 256. 1856. — Emmons, E., *Report North Carolina Geol. Surv.*, p. 225, figs. 47, 48, 1858. — Leidy, J., in F. S. Holmes' *Post-Pliocene Fossils of South Carolina*, p. 120, pl. xxv, figs. 3-8. 1860.

³ *Proc. Acad. Nat. Sci. Philad.* vol. VII, p. 221. 1856.

and its present whereabouts are unknown. The so-called *Ischyrrhiza antiqua* is stated by Leidy to occur in New Jersey, North and South Carolina, New Mexico and Mississippi, but the differences between this and *I. mira* are inappreciable, and the two were finally pronounced identical by their author. Certain hypural fans similar to those accompanying Protosphyræna in the English Greensand have been theoretically associated with *Ischyrrhiza*, but with questionable propriety.¹ No reasons have been assigned for making this association, and other considerations militate against it, hence it appears advisable to exclude these fans altogether from the same genus.

The wide geographical distribution enjoyed by *Onchosaurus* is shown by its occurrence not only in Europe and America, but also in the Upper Cretaceous of Egypt. In 1887 a tooth differing from the type species only in unimportant particulars was described by Dames² from the Senonian of Gizeh under the name of *Titanichthys pharao*, the generic title being subsequently changed to *Gigantichthys*. Dames' figure was copied by Zittel in his "Handbuch",³ and the two authors agree in placing this form in the vicinity of *Enchodus*, although "*Ischyrrhiza*" is referred by Zittel in the same work to the *Esocidæ*. The latter position was first suggested by Cope, and is likewise adopted by O. P. Hay.⁴ It will be seen, therefore, that there is good authority for regarding *Onchosaurus* as one of the early fore-runners of the pikes.

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¹ Cope, E. D., *Vertebrata of the Cretaceous Formations of the West*, p. 280. 1875.—Clark, W. B., *Bull. U. S. Geol. Surv.* no. 141, p. 60, pl. vii, fig. 2a. 1897.—*Maryland Geol. Surv., Eocene*, p. 112, pl. xii, fig. 8. 1901.

² *Sitzungsber. Ges. naturf. Freunde*, Berlin, p. 70, with figure, and p. 137. 1887.

³ *Handbuch der Paläontologie*, vol. III, p. 269, fig. 274. 1890.

⁴ *Bull. U. S. Geol. Surv.* no. 179, p. 398. 1902.